SF253
F17

New York
State College of Agriculture
At Cornell University
Ithaca, N. Y.

Library

Simplified Instructions
ON
The Babcock Test

By

The Fairmont Creamery Co.
of
U. S. A.
M. W.

Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924002949471

PREFACE

The Fairmont Creamery Company of the United States of America, Home Office, Omaha, Neb., was organized April, 1883, in the town of Fairmont, Neb., from which it derived its name.

It was organized by a few enterprising men, among whom Mr. J. H. Rushton was a leader, and who is and has been President of this Company for thirty-one years.

It was a keen conception of the importance of dairying and its relation to the prosperity of the country in encouraging stock production, and in maintaining the fertility of the soil, that prompted its inception. The spirit of fairness and a desire to help their patrons has been and is a predominant feature of the organization, and it was this desire to help that prompted the publication of this manual of instruction.

ACKNOWLEDGMENT

We are indebted to the Superintendent of our Buffalo Creamery, Prof. D. M. Wilson, for its preparation. From his long experience and exceptional training we feel sure that it will supply information and give you assistance in solving many of your dairy problems.

THE FAIRMONT CREAMERY COMPANY
U. S. A.
HOME OFFICE, OMAHA, NEB.

HOME OFFICE

INDEX

Introduction .... Page 3
A Long Felt Want Supplied .... ‘‘ 3
The Principles of The Test .... ‘‘ 4
A Growing Need .... ‘‘ 5
Different Makes of Centrifuges .... ‘‘ 5
Diameter and Speed of Machine .... ‘‘ 6
What Constitutes the Test .... ‘‘ 6
Sulphuric Acid—Its Strength and Care .... ‘‘ 6
Test Bottles .... ‘‘ 7
The Reason Eighteen Grams was taken as a Sample .... ‘‘ 7
Taking Samples of Milk .... ‘‘ 8
Measuring Samples .... ‘‘ 9
Adding of the Acid .... ‘‘ 10
Centrifuging the Milk Test Bottles .... ‘‘ 10
Defects of the Test .... ‘‘ 10
Reading the Test .... ‘‘ 11
Testing Skimmed Mllk .... ‘‘ 11
Reading Milk Tests .... ‘‘ 12
Testing Butter Milk .... ‘‘ 12
Testing Whey .... ‘‘ 12
Color Indicates Proper Chemical Action .... ‘‘ 12
Cream Test Bottles .... ‘‘ 12
Taking Samples of Cream .... ‘‘ 13
Preparing the Sample for the Babcock Bottle .... ‘‘ 14
Amount of Acid .... ‘‘ 14
Best Methods of Mixing .... ‘‘ 14
Whirling the Cream Bottle .... ‘‘ 15
Reading the Test .... ‘‘ 15
The Use of Glymol in Reading Cream Tests .... ‘‘ 15
Does the Souring of Cream Affect the Percent of Butterfat .... ‘‘ 16
Some Specifics .... ‘‘ 16-18
Herd Records .... ‘‘ 18
Less Labor and Gives Good Results .... ‘‘ 18
How to Keep Herd Records .... ‘‘ 19
Butter and Butterfat are Different .... ‘‘ 19
Cream Tests Will Vary .... ‘‘ 20
Influencc of Temperature on Percent of Fat in Cream .... ‘‘ 20
The Feeding Value of Skimmed Milk .... ‘‘ 21
Milk is Nature’s Food .... ‘‘ 21
Calves Fed on Skimmed Milk .... ‘‘ 22-24
Raising of Calves on Skimmed Milk .... ‘‘ 24
Skimmed Milk Valuable as an Egg Producer .... ‘‘ 26
The Market Value of Eggs .... ‘‘ 27
Do Hogs Pay? .... ‘‘ 28
Skimmed Milk and Forage Crop Cheapeus the Cost of Pork Production ‘‘ 28
Fertility Means Money (Skimmed Milk is a Fertilizer) .... ‘‘ 30

"INTRODUCTION"

The object of The Fairmont Creamery Company of the U. S. A. in publishing this Manuel is primarily to help their patrons, by giving as brief and yet complete instructions on the Babcock Test, as is essential with this work.

Care has been taken to eliminate and substitute as many of the technical terms as we could with common ones to make the instructions easily understood.

There is no reason why any dairyman cannot make accurate tests of his milk and cream. There are many reasons why he should. If he will follow carefully the instructions given, be painstaking, fully appreciate the necessity of accurate sampling, and familiarize himself with the underlying principles of the Babcock Test, then tests made by him will be accurate.

A great many dairymen are keeping unprofitable animals. It is imperative to their success that they know what their individual cows are doing, and that the boarders are weeded out. This will reduce the cost of production and thereby increase their profits.

Our advice to dairymen is to diligently seek knowledge. It is light, that will expel and drive out suspicion, which is a canker that produces decay of their ambition and affects their success. We sincerely believe the more you know about the business you are engaged in, the better it will be for you.

We are especially desirous that you make yourself familiar with the Babcock Test, thereby knowing and not guessing at the results of your individual cows or your milk or cream tests.

Our business and yours is closely related. Therefore, we wish you to know as much about it as we. Without this knowledge you may labor under a misapprehension, which would be injurious to you and to us. We proffer our assistance in every way possible, invite your correspondence and co-operation to the end that you may be profited by knowing us. Familiarize yourself with the Babcock Test that you may know that those you deal with are on the square.

"A LONG FELT WANT SUPPLIED."

It is a quarter of a century since the Babcock Test for Butter fat was given to the public. Since then, wonderful advance has been made in dairying.

Prior to 1850 the manufacture of butter and cheese was confined to the farm. The first assembling of milk to one place, of which we have accurate knowledge, was started in 1851 in Oneida County, New York, by Mr. Jesse Williams, who owned a farm and received milk of his neighbors, and manufactured it into cheese. Mr. Williams' idea of concentrating the milk to one place to be manufactured proved to be much more economic than the individual farm methods. Therefore, the new system soon found favor in the progressive dairy sections of United States and Canada.

With the rapid growth of the new system it became imperative that some simple method to determine the butter fat in milk be devised. A great many different tests were invented, but never came into general use, owing to their lack of simplicity. Dr. Stephen Moulton Babcock of the Wisconsin Experiment Station, in July, 1890, supplied this long-felt want, and the world is indebted to him for his scientific discovery, which he freely gave to the cause of dairying. The more the farmers realize the importance and possibility of systematic improvement in their dairy herds, the greater the demand for information in regard to operating the Babcock Test.

While a great deal has been said about testing milk and cream, it would appear from the information obtained that the subject is not fully understood by all, and that many now operating the Babcock Test could improve by adopting some of the more recent improvements.

The Babcock Test, while simple and accurate, yet a thorough knowledge of the underlying principles is necessary to accurate and uniform results. Then, too, when the Babcock Test first came into general use it was used principally to test milk, but of late it has been used to test cream, skimmed milk, whey, buttermilk, butter, ice cream, etc. The new use to which it is put makes necessary specific instructions pertaining to the test of each commodity.

Some think that the Babcock Test is a complicated process, and at best unreliable. This is an erroneous idea; the test is simple, accurate and easily mastered by anyone who will give the matter careful study and attention.

"THE PRINCIPLES OF THE TEST."

Owing to the butter fat being the lightest component part of milk, the theory of testing is very simple. The fat globules of milk will, upon standing, rise to the surface, forming a layer of cream. They do not all rise, owing to the viscosity which the other solids give the milk. Dr. Babcock found that sulphuric acid would dissolve the other milk solids without affecting the globules, and thus permit them to rise to the top more readily. The sulphuric acid having a higher specific gravity helps to increase the difference between the weight of the fat globules and the mixture, thus making possible a complete separation of the fat from the mixture when subject to centrifical force.

When the bottle containing the mixture is placed in the Babcock Machine, and whirled, they take on a horizontal position, thus throwing the heavier portion furthest from the center and forcing the butter fat to the neck of the bottle, where it can be read direct in percentage. The neck of the bottles are so graduated that when the proper weight of the cream or milk is taken, the reading will represent the percentage of butter fat the milk or cream contains. This will be discussed more fully later.

"A GROWING NEED."

Within the last decade there has been a growing demand for more agricultural education. It is a general opinion that the best place to teach agricultural education is in our public schools. This will bring the children in closer touch with nature, and in a measure make their education more complete. There is every reason why agricultural work should be extensively taught in our schools. It is here that the boys, and girls as well, receive their first impression as to what is to constitute their life work. This study of the fat content of milk is easy, and at the same time one of the most practical and useful lessons for everyone interested in dairy industry, whether it be from the producer or consumer's standpoint.

Teaching the farm boy how to determine the richness of milk is incidentally educating the future dairyman to a higher standard in milk production and quality.

Prompted by the desire to aid those interested in the improvement of dairying, and in computing accurate tests, we present this brief, simplified manual of instruction, discussing individually each phase of the Babcock Test as applied to the commodity to be tested.

"FIGURES NOS. 1 AND 2 SHOW SOME DIFFERENT MAKES OF CENTRIFUGES."

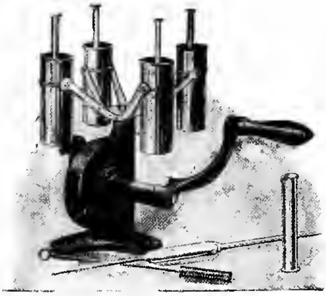


Fig. 1

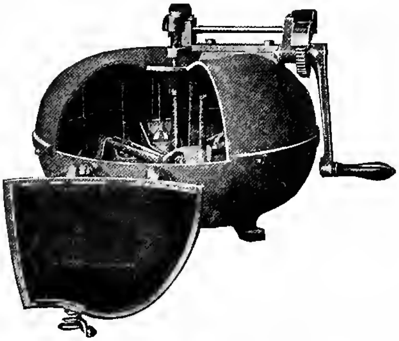


Fig. 2

The name of different machines used for centerfuging the Babcock test bottles seem to cause those not experienced, to think they are not Babcock tests. The name on the (centerfuge) or the test machine is given by the manufacturer to designate their style or make from others.

The machines are made in different sizes, both in respect to the number of test bottles they will whirl at a time, as well as diameter. They are also made so they can be whirled by hand, steam, or electricity. The machines must be whirled in proportion to their diameter. This is necessary, as a certain centrifical force must be generated to completely separate the butter fat.

The following table gives the number of revolutions per minute for the various diameters.

Diameter of Machine	Revolutions per minute
12 inches	980
14 "	908
16 "	848
18 "	800
20 "	759
22 "	720
24 "	693

To find the diameter of any machine, measure from the bottom of the opposite bottles while in a whirling position.

●

"WHAT CONSTITUTES THE TEST."

The test bottles and the methods employed in making milk or cream tests are what constitute the Babcock test.

1st. Dr. Babcock designed the test bottles so the percentage of butter fat can be read direct from their graduated necks, when 18 grams or its equivalent is taken as a sample.

2nd. He also dispensed with the use of all but one chemical in making a test, namely, sulphuric acid.

"SULPHURIC ACID—ITS STRENGTH AND CARE."

Sulphuric acid can be secured all most any drug store, or from dealers in dairy supplies. There are two kinds on the market; the chemically pure, commonly known as the C. P., and the commercial. The commercial is what you should buy. If it is of proper strength, its specific gravity should be about 1.82. Do not buy the C. P. for testing purposes.

The acid should be kept in a glass stopper bottle, as it will weaken rapidly if left exposed to the air. Since the acid destroys wood, cloth, and nearly all kinds of metal, it should be handled with care. A small bottle of household ammonia should be kept on hand by users of sulphuric acid, as it is a good thing to apply immediately to the hands or clothing upon which acid has been accidentally spilled.

"TEST BOTTLES."

The Babcock test bottles are made and graduated to suit the commodities to be tested, namely, milk test bottles, skimmed milk test bottles, cream test bottles, butter test bottles, etc. These will be discussed in connection with the instructions in regard to testing these different commodities.

Test bottles bought from reliable sources, usually are accurate, but as a guarantee of accuracy they should be retested and approved by the Experiment Station of the State.

Bottles not kept thoroughly cleaned, or used without cleaning between different tests, will result in defeating the object of the test.

"THE REASON EIGHTEEN GRAMS WAS TAKEN AS A SAMPLE."

Doctor Babcock in devising the principle of the Babcock test first took into account the specific gravity of milk, which is found to average 1.032, or in other words, milk is thirty-two one thousandths (.032) heavier than distilled water at the same temperature; as well he considered the specific gravity of butter fat, which is found to be nine-tenths (.9), or ten one-hundredths (.10) lighter than distilled water at the same temperature. He also took into account that 1 cc. of distilled water equaled 1 gram in weight at 39.2 degrees F. He then calculated what quantity of butter fat could be conveniently used with the greatest accuracy and with the smallest cost. He further calculated that by taking the 18 grams as a sample and comparing the difference between the weight of water and of butter fat that a tube holding 2 cc. water would hold exactly 1.8 grams of butter fat, or, in other words, 10 per cent. of 18 grams. For example, if 1. cc. of butter fat weighs .9 grams, 2 cc. would weigh 1.8 grams, then 1.8 multiplied by 100 and divided by 18 grams will equal 10 per cent. of the sample taken. Then by dividing the 2 cc. space in 10 equal parts it would give the reading in per cent., and the subdivision of each would give the fractional reading of the percentage. The test at this time being devised for the purpose of testing milk it was thought advisable to arrange some measures by which the 18 grams could be delivered to the Babcock bottle, which would relieve the task of weighing the sample. The specific gravity of pure milk being practically constant at 1.032, by dividing this into 18 grams the result is 17.44 cc. From this calculation the 17.6 pipette was prepared, allowing .16 cc. to adhere to the pipette. The specific gravity of butter fat being .9 and milk containing an average of 3 to 4 per cent. made it possible to measure milk for the test with reasonable accuracy, therefore the measuring of milk by a pipette, for the Babcock milk bottle is fairly correct.

This does not apply to cream, as cream varies in the per cent. of butter fat from 15 to 60 per cent.; on account of this variation there is a difference in the specific gravity (or weight), therefore cream sample should be carefully weighed to be absolutely correct.

"TESTING."

Since the testing of milk, cream, skimmed milk, buttermilk, etc., needs slightly different treatment, it will be necessary to study each separately.

"TAKING THE SAMPLE OF MILK."

It must be kept in mind that the accuracy and value of the test, depends, first of all, on whether the portion first taken from the original milk will truly represent that from which it is taken.

For example: The first milk drawn from the cow is low in butter fat, while the last is very rich. It, therefore, is absolutely necessary that the sample be taken from the total amount of milk given.

It is imperative that the milk be thoroughly mixed in order to get an even distribution of the fat, or that portion taken will not be of average richness, and the result of the test rendered worthless. The butter fat being the lightest constituent of milk, it moves upward the moment it is allowed to stand. On this account, great care must be taken to mix the milk thoroughly, and to take the sample immediately after the mixing is completed.

Milk can be properly mixed by stirring, if the proper means be used. It is best, however, to pour the milk two or three times before taking the sample for the test. A small dipper as represented by Fig. 3 will be found convenient in taking a sample.

Fig. 3

If this sample is not to be tested at once it should be put in a bottle supplied with an air tight stopper, and have one or two drops of formaldehyde added to prevent souring. Care should be taken in using preservatives owing to their poisonous nature. If the sample has been preserved and held for a few days before testing, it will be necessary to warm it to about 100 degrees F. by placing the sample jar in warm water. After this temperature has been reached, mix the sample thoroughly and proceed at once to measure or weigh out the required amount for the milk test bottle.

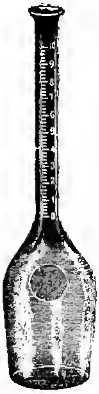


Fig. 4

Fig. 4 represents the milk bottle. They are graduated from 0 to 8, and from 0 to 10%. The 0 to 8% is considered the most accurate, as it aids in reading. The milk bottle is constructed on the principles that when eighteen grams, or its equivalent, is taken of milk the percentage can be read direct from the graduated portion of the neck of the bottle.

"MEASURING THE SAMPLE."

Fig. 5 represents the pipette, and Fig. 6 the method used in transferring the proper amount to the bottle. The pipette used for measuring milk is graduated to 17.6 cc. Draw the milk into the pipette by suction above this mark, place your forefinger over the pipette and release gently until the milk flows down to the mark. Discharge this amount into the milk bottle. Babcock bottle and sample should be placed in ordinary cold water, and the temperature reduced to about 65 to 70 degrees F. before the acid is added. The acid should be at the same temperature.

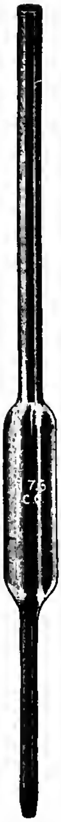


Fig. 5

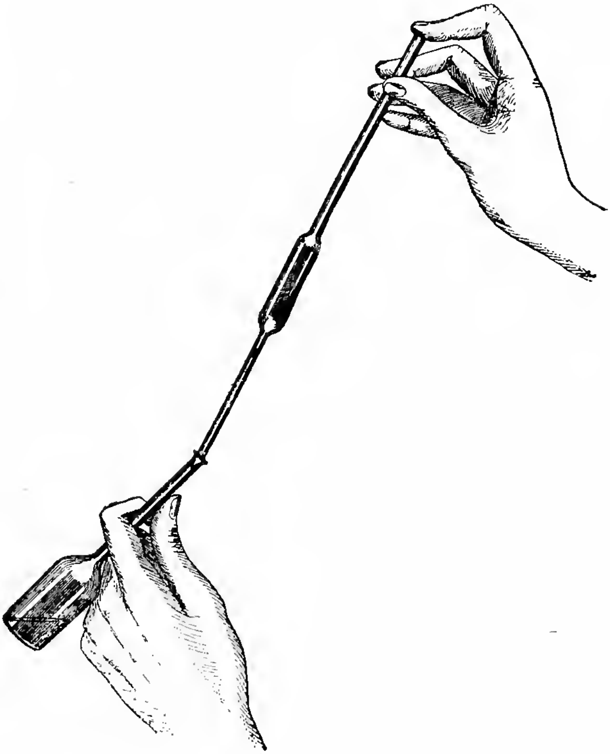


Fig. 6

"ADDING OF THE ACID."

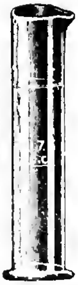


Fig. 7

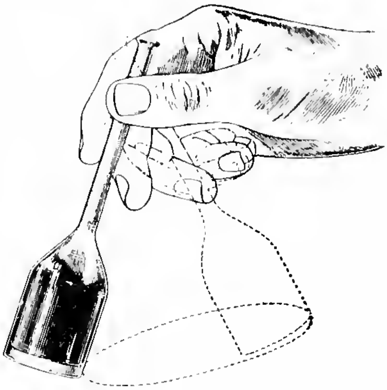


Fig. 8

The acid should be carefully measured into the acid graduate, as represented by Fig. 7, remembering to have both the acid and the milk between 60 and 70 degrees F. On adding the acid, hold the bottle at an angle of 45 degrees, pouring the acid slowly down the neck of the bottle, being careful to rinse all the milk down with the acid, and not to jar the sample during the process, as by so doing, there are liable to be particles of charred matter appear in the fat, rendering the test inaccurate. The bottle containing the acid and milk should be rotated in the hand (see Fig. 8), throwing the acid gently around the outside of the milk, thus dissolving the sample away gradually without breaking the coagulum during the process. Care should be taken to rotate the acid and milk until the milk solids are thoroughly dissolved, as too little shaking will be liable to produce a curdy matter in the fat column of the test, rendering it inaccurate.

"CENTRIFUGING THE MILK TEST BOTTLES."

The bottle should be placed in the machine in such a way as to maintain a perfect balance and run at the proper speed for at least five minutes. Enough boiling water should then be added to fill the bottle to the shoulder, whirl again for two minutes. It should then be filled to within one-half inch of the top of the bottle with boiling water, and again whirled for two minutes. If the test has been properly treated in respect to temperatures, acid, etc., the fat column will be perfectly clear, of a light straw, or amber color, free from curdiness, charred particles, or specks of any kind, and the water directly under the fat will be perfectly clear.

"DEFECTS OF THE TEST."

The principle defects in milk tests are curdiness, cloudiness, burnt particles, or dark color, or too light color. If the acid or the milk be too warm, or the acid too strong, there will be a danger of having a charred condition of the fat, or black particles mixed with the fat column. While, on the contrary, if the acid be too weak, or the milk or acid too cold, or not enough acid used, the fat will be light colored, or curdy. If sufficient speed of the machine has not been maintained, or if it has not been whirled for sufficient length of time, the tests are liable to be cloudy. This is especially true if the samples are not kept warm enough while being whirled.

"READING THE TEST."

Observe closely the color and clearness of the butter fat. If the column of fat is perfectly clear, and of the desired color, you can proceed with the reading. If not, the test should be made over again. In reading the percentage of fat in the neck of the milk bottle, tests are read from the bottom to the extreme top. (See Fig. 9.) A pair of dividers, as shown in Fig. 10, will be found advantageous both for accuracy and speed in reading. To use dividers, see Fig. 10. Support the lower finger of the divider by the thumb nail, placing the point on a line with the fat, then bring the top finger of the divider to the top line of the fat. Hold the finger at this exact position, then place the lower finger of the divider on zero, and the top finger will indicate the per cent. to be read. In reading the test, the bottle should be held perpendicular, and in line with the eye. This is necessary in order to see that the point of the divider rests directly on a line with the fat.

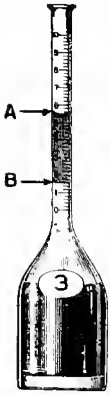


Fig. 9

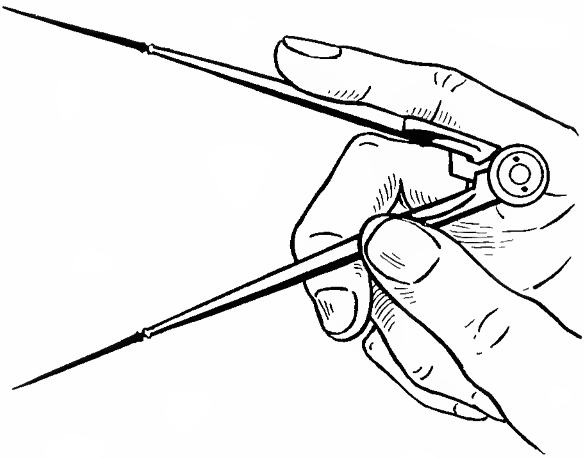


Fig. 10

"TESTING SKIMMED MILK."

The skimmed milk test bottle is constructed with two necks. See **Fig.** 11. The large neck is the one through which the skimmed milk and the boiling water is added. The smaller is the one in which the butter fat is collected in whirling for reading and is usually graduated to 5/100% with a capacity of ½%.

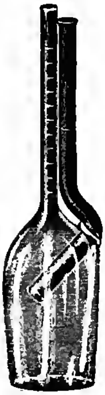


Fig. 11

The skimmed milk should be tested occasionally to make sure that there is no unnecessary loss of butter fat. The loss should not exceed 5/100 of 1%. On account of the small amount of fat usually found in skimmed milk, it is not difficult to secure an accurate sample. It should, however, be taken from one complete skimming. After all the air has been expelled from the sample take a 17.6 cc. and discharge this amount into the skimmed milk bottle. Slightly more acid will be needed than in testing whole milk owing to the increased solids (not fat) in skimmed milk. Mix the acid and skimmed milk, as in milk testing; place in the Babcock test machine and whirl for at least seven minutes at full speed. Then add boiling water, filling the large neck to the top. Whirl again for at least two minutes. The test bottle must be kept hot during the entire process, by either placing boiling water in the tester or remove the Babcock bottle and set in boiling water once or twice during the period of whirling.

The ordinary milk test bottle should not be used in testing skimmed milk, as the graduation is not fine enough. More centrifical force is needed, as the globules left in skimmed milk are the smaller ones; on this account they separate more slowly, therefore extra time in whirling is essential, to be sure that all the fat is recovered.

"READING THE TEST."

The fat in the neck of the skimmed milk bottle should be of a light straw color and perfectly free from specks or charred particles.

By placing the finger on top of the large neck of the bottle, and gently pressing it, the butter fat in the small neck can be raised to an even graduated mark, thus rendering it possible to read the butter fat direct, without the aid of dividers.

"TESTING BUTTER MILK."

The same bottle as in testing skimmed milk is used and the same amount and principle applied, only less acid will be required.

"TESTING WHEY."

Use the skimmed milk bottle and take 17.6 cc. as a sample, and follow the instructions given in testing skimmed milk with one exception. A very small quantity of acid is required, as whey contains a very small percentage of solids.

"COLOR INDICATES PROPER CHEMICAL ACTION."

In mixing the acid with milk, skimmed milk, buttermilk, or whey, if the operator is observant, he will soon become familiar with the proper color indicating the proper chemical action, to insure uniform and satisfactory results. The mixture should resemble wine or dark cherry.

"CREAM TEST BOTTLES."

In the testing of cream, as in other dairy commodities, a bottle constructed especially for cream must be used. A number of styles of cream test bottles have been placed upon the market. To discuss these at length, while it would be interesting, it probably would be of little value except to make you familiar with their advantages or defects.

There are two styles of cream test bottles in common use. See Figs. 12 and 13. The old is the 18 gram, 6 inch, 50 per cent. graduated to read in per cent. The neck of this bottle is rather wide, which increases the depth of the concave in the butter fat column, making possible a one or two per cent. error in reading. The new style of bottle, which has the endorsement of the Official Instructors Association of the United States, and is coming into general use, is known as the 9 gram cream bottle, commonly made 6 inches long, and graduated from 50 to 60 per cent., and can be read in one-half per cent. The diameter of neck of 9 gram is only one-half that of 18 gram.

This bottle is considered more accurate and is coming into general use on this account. The amount of cream for the test must be taken in proportion to the requirement of the bottles, namely, 9 or 18 gram, respectively, which should be weighed into the bottles. The cream balance must be very sensitive.

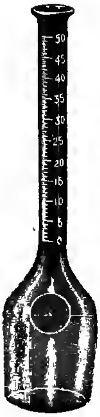


Fig. 12

The New Style
9 gram bottle

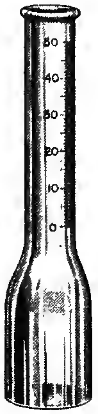


Fig. 13

The Old Style
18 gram bottle

Where the sample of cream of necessity or for convenience is measured by pipette, the 18 cc. or 9 cc. pipette is used. These pipettes are designed or intended to deliver 9 or 18 grams in weight. "The reason eighteen grams is taken as a sample" has been previously explained. and tells why the weighed sample is more accurate than the measured. A proper cream balance is so sensitive that it is not put to general use on the farm, nor can it be safely carried by traveling testers.

"TAKING SAMPLES OF CREAM."

It is customary to take 3 to 4 ounces from the original container. After this sample is taken, if not tested at once, should be sealed air tight, for if left exposed to the air, the moisture will evaporate and the sample will become inaccurate. To preserve a sample of cream two or three drops of formaldahyde may be added.

The slightest error either through carelessness or lack of knowledge in taking a sample of cream will make the results of a test mere guess work, and the purpose for which the test is made is defeated.

Inasmuch as the butter fat is the lightest constituent of milk or cream, errors in sampling usually result in giving a higher test than the milk or cream contains.

The cream may be mixed for sampling by pouring from one vessel to another several times, and the amount needed taken at once. The most convenient method is to use a cream sampler and stirrer as represented by Fig. 14.

The cream must be vigorously stirred from bottom to top until there is no doubt about its uniformity, and enough for a sample taken immediately before the fat begins to rise.

Too much attention cannot be given the mixing of the cream to get a correct sample. For example, one pound of cream will weigh 456.6 grams, 100 pounds will equal 45,660.0 grams. If 9 grams be taken as a sample, and it is inaccurate, for want of proper mixing, the error will be multiplied many times.

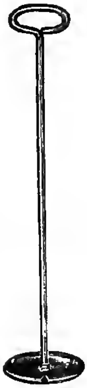


Fig. 14

"PREPARING THE SAMPLE FOR THE BABCOCK BOTTLE."

The sample of cream should be placed in water sufficiently warm to raise the temperature to between 95 and 105 degrees F. This is essential in order to bring the sample into a homogeneous consistency. When the proper temperature is reached, the same should be well mixed by shaking or pouring, or both, and immediately weigh out the proper amount for the Babcock bottle. When scales are not used and the charge is taken with a pipette, the sample should be mixed by pouring as this will expel the air and make the measured quantity more compact and hence nearer accurate. Fig. 15 represents the 9 cc. pipette; Fig. 16 the 9 cc. acid measure.

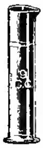


Fig. 16

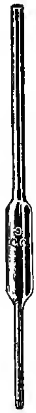


Fig. 15

"THE AMOUNT OF ACID."

As in the case of milk, the cream and acid should be between 60 and 70 degrees F. before mixing. Judgment will have to be exercised as to the amount of acid required. The acid is used to dissolve the non-fatty solids, hence acid in proportion to these will have to be used to get the proper chemical action and the eliberation of the butter fat. Cream containing a high percentage of butter fat will have less solids and will require less acid, or in other words, less acid must be used in proportion to the butter fat present in the cream.

Sufficient acid should be used to cause the mixture to take on the color of coffee to which a little cream has been added, or to produce a dark chocolate color in from one to two minutes after the mixing.

"BEST METHODS OF MIXING."

It is well not to use more than two-thirds the amount of acid in proportion to the sample of cream taken. When this is well mixed if the desired color is not obtained, enough more acid must be added to produce the proper chemical action, which will be indicated by the color of the mixture. When the mixture takes on the proper color, about 10 cc. of boiling water should be added. This will prevent a further action of the acid on the butter fat. The sample is now ready to be centrifuged.

"WHIRLING THE CREAM BOTTLE."

Centrifuge the cream test bottle for at least five minutes at full speed. Boiling water is then added to about one-half inch of the top of the bottle neck, and the sample is whirled again for two minutes. During the whirling process the test bottle must be kept hot by the use of steam or boiling water.

If the cream and acid were of the proper temperature when mixed; the right amount of acid used; the water added at the right time, or when the proper color is reached; the proper temperature and speed maintained throughout the process, the fat column will be of a light amber or straw color, free from charred particles, curdy matter or visible impurity. Unless the fat column presents this desirable qualifications, the test should be made over.

"READING THE TEST."

In reading the test, the bottle should be held perpendicular and on a level with the eye between the operator and some unshaded light. Place the thumb nail at the lower point of the fat column, upon which to support the lower arm of the dividers. Then gradually raise the upper arm of the dividers until it points directly upon the middle of the dark line found in the upper curved portion of the fat column. The dark line appears in about the center of what is termed the meniscus. The dividers are then held rigidly and the lower arm placed at the zero mark; the point then indicated by the upper arm is the per cent. of fat to be read.

In reading milk the entire fat column is read, but in cream correct allowance must be made for the meniscus, or the curvature at the top of the fat column.

"THE USE OF GLYMOL IN READING CREAM TESTS."

The meniscus and its influence on accurate reading of cream tests for a long time has attracted the attention of investigators, in endeavoring to conceive some means of overcoming it and its effects. In Bulletin 337, page 44, issued October 19, 1913, by the Department of Dairy Industry, Cornell University, Ithaca, N. Y., they give the results of a number of experiments in reading cream tests, with and without the use of glymol. A large number of Babcock tests were made and these were read in the regular way, and they were also read by the use of glymol as a meniscus remover. The results of these readings were checked by chemical analysis.

From the results obtained it would appear that the use of glymol as a meniscus remover before reading the tests is advisable, as it insures a greater degree of accuracy in reading. Glymol is a petroleum distillate, known commercially by the name of White Mineral Oil. It is colored by submerging in it in cheese cloth a sufficient amount of Alkanet Root to color the oil a bright red.

This White Mineral Oil or Glymol is very light, therefore floats on the top of butter fat. (See Fig. 17). When tests are ready to be read about five drops of glymol should be added, allowing it to run down the neck of the bottle. On account of it being light and different in color it flattens the meniscus, causing a sharp line of demarkation indicating the exact point of reading.

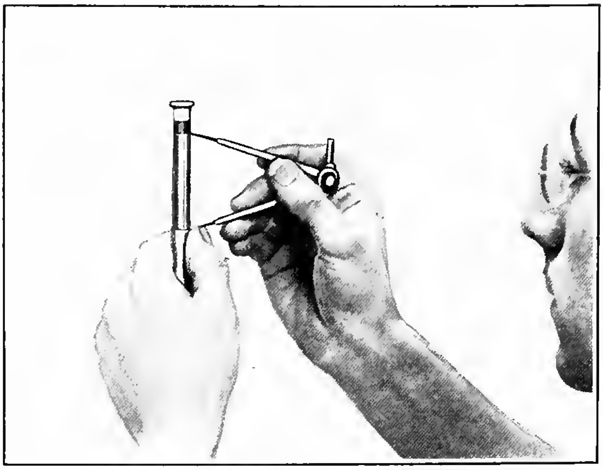


Fig. 17

The use of glymol has also been recommended by Purdue University, Lafayette, Indiana, in Bulletin 145 under experiments conducted by Prof. O. F. Hunziker.

"DOES THE SOURING OF CREAM AFFECT THE PERCENTAGE OF BUTTER FAT?"

This question is oftimes asked and many times wrongly answered.

The souring of cream has no effect on the butter fat as regards to its quantity; that is, souring does not take from, reduce or add to the test, if the testing is properly done.

It is sometimes difficult to secure an accurate sample of sour cream. This is only true when it contains too much milk, which is difficult to break up after it has become sour. If the cream, however, is separated so as to contain not less than 30% butter fat and is stirred occasionally while souring, it will take on a silky consistency, making it easier to secure an accurate sample.

Sour cream in testing will require less sulphuric acid in proportion to its acidity, as the natural acid has to some extent performed the work that the sulphuric acid is intended to do. Therefore, sour cream can be tested with just as high a degree of accuracy as can sweet.

"SOME SPECIFICS."

These should be committed to memory:

1st. If the cream is sampled by stirring instead of pouring, it must be mixed with a vigorous up and down movement from top to bottom, using the proper instrument made for this purpose, as illustrated by Fig. 14, to get a thorough mixing.

2nd. The mixing should be continued until there should be no possible doubt as to the accuracy of the sample.

3rd. Errors in sampling on account of the small amount taken for the Babcock bottle, will be multiplied many times.

4th. The least carelessness in the sampling will make a test mere guess-work and the purpose for which it is made is defeated.

5th. On account of the butter fat being the lightest constituent of milk, it is constantly coming to the surface. Therefore, if errors are made they usually result in a higher test than the milk or cream contains.

6th. Samples not tested as soon as taken must be sealed air-tight to prevent evaporation of the moisture, to insure accurate tests.

7th. The composite samples of milk can best be preserved by the use of formaldehyde. Three drops will preserve one-half pint of milk for two or more weeks. If necessary to hold for a longer period, one extra drop should be added at the termination of two weeks.

8th. Too much formaldehyde will interfere with the action of the sulphuric acid.

9th. Composite samples of milk should be warmed to between 95 and 105 degrees F. and the fat well incorporated, before a charge is taken for the Babcock bottle.

10th. It is imperative that all cream samples are warmed and well mixed before the charge is weighed or measured into the cream bottle.

11th. The amount of milk for a test can be measured by the use of 17.6 pipette.

12th. All test tubes must be thoroughly cleansed after each using.

13th. Sulphuric acid should be kept in a glass stopper bottle and not left exposed to the air, or it will become weaker.

14th. Fat columns that are not perfectly clear and free from charred particles, and of a light yellow straw color should be retested for if read they probably would be inaccurate.

15th. The use of glymol in reading cream tests has been approved by Cornell University. It is placed on top of the butter fat to level the meniscus, and indicate the exact point for reading.

16th. Cream should be weighed into the cream test bottle to be absolutely accurate. The cream balance used must be very sensitive, or tests will not be correct.

17th. If for convenience or of necessity, the sample is taken with a pipette, the cream should be mixed by pouring, after it has been warmed to the proper temperature; which should be practically 100 degrees F. The pouring will expel air and produce a more accurate sample.

18th. Nine gram 50 per cent., 6-inch direct reading cream bottles are considered the most satisfactory.

19th. Charred or dark butter fat columns are generally caused by too high temperature of the acid, milk or cream; too much or strong acid; or by allowing the acid to work too long on the sample of cream before boiling water is added. They may also be caused by rough or improper mixing of the acid and cream.

20th. Curdy or light colored fat columns are generally due to acid, milk or cream being too cold when mixed; too weak or not enough acid; adding the boiling water too soon before the acid has had time to sufficiently act on the sample, or allowing the test to get cold while being made. Also lack of sufficient speed in the centrifuge or insufficient mixing of the cream and acid.

21st. Acid, milk and cream should be between the temperature of 65 and 70 degrees F.

22nd. The test should be kept hot while being made and only boiling water should be used in connection with the tests. If the water is hard, the lime should be precipitated before being used by the addition of a few drops of acid. Rain or distilled water will give clearer and better results.

23rd. Tests should be read while the temperature is between 120 and 140 degrees F.

24th. The dairyman who fails to keep a record of each cow may be losing his profits through the boarder.

25th. The moisture in butter varies. Therefore to compare pounds of butter made with pounds of butter fat as indicated by the Babcock test is misleading. Accuracy of tests cannot be checked by churning.

"HERD RECORDS."

The weighing and sampling of each milking for an entire year seems to entail so much work that the average farmer is not inclined to keeping records of his individual cows. On this account, a great many farmers are milking unprofitable animals, and for this reason the following instructions are given with the hope that it may at least get many dairymen started in keeping records.

"LESS LABOR AND GIVES GOOD RESULTS."

To eliminate as much work as possible, and at the same time, get an approximate, or close calculation of the total pounds of milk and butter fat produced by the average cow for each year, we recommend a system of weighing and sampling three days' milk per month.

The three day system, while it will not produce as accurate results as the individual weighing and sampling of each milking, it is, however, close enough for ordinary purposes.

"HOW IT IS DONE."

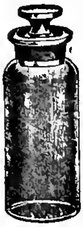


Fig. 18

Fig. 19

A record sheet should be prepared, giving the name or number of each cow. A small closed top jar (See Figs. 18 and 19), such as a one-half pint fruit jar, for each cow must be supplied and labelled, giving her name or number. Begin weighing (See Fig. 20), say the first day of the month, and take a sample of the milk at the time of being weighed, and place in a jar representing the cow. This should be done both night and morning. Then weigh and sample again the night and morning milk of the 10th and 20th of the month.

Before the milk is placed in the sample jar there should be added to the jar three drops of formaldehyde. This will preserve the sample and keep it from souring. After the sample of three days, or six milkings, has been taken, it can be tested any time within the next ten days as the sample jars will not be needed until the first of the coming month, the result of which will give a fair average of the per cent. of fat in the milk for the month. Add the weight of the three days milk, and multiply it by ten. This will give, approximately, the pounds of milk given by each cow for thirty days. Then multiply the pounds of milk thus approximated by the test; this will give the estimated pounds of butter fat for thirty days.

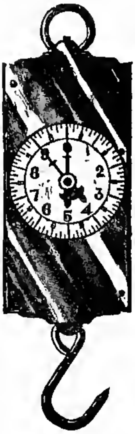


Fig. 20

By following this system little work is necessary and the results will agree very favorably with those obtained by daily weighing and sampling.

The dairyman who will do this for one year will feel that the small amount of work entailed in keeping the records has been well spent. It will enable him to eliminate the unprofitable animal, giving him knowledge of the cow from which to raise the calf, that will likely be the best producer, and in the end make dairying more profitable.

"BUTTER AND BUTTER FAT ARE DIFFERENT."

Most dairymen do not seem to understand that there is a difference between butter and butter fat. They, therefore, attempt to check up the accuracy of the Babcock test by the pounds of butter made from a known quantity of cream. When this is done and a difference is found, they begin to doubt the accuracy of the Babcock test.

Butter fat is the oil of milk or cream. Butter is the oil to which is incorporated in churning some of the natural moisture of milk (water) and other milk properties, as well as the salt added. The difference or increase in butter over butter fat as reckoned by Dairy Authorities is one-sixth. This method of reckoning will apply only in as far as the moisture, etc., is normal. Since the moisture, casein and like properties of butter differ in different butters, as influenced by methods practiced in butter making, it is misleading to attempt to check the accuracy of the Babcock test by butter churned. As a comparative illustration of this, we might mention bread and flour.

The component part of bread is flour and the balance is moisture, yeast and salt, consequently there is a yield of bread over flour, but it would not be practical to attempt to compare the accuracy of a scale that weighed the flour by comparing the pounds of bread made from it.

Much of the butter made on the farms is churned from cream that is entirely too warm, and is many times washed in water of too high a temperature. This affects the body and texture of the butter, causing an abnormal moisture content. On the contrary when the cream is churned and washed at the desired temperature, salted and worked so as to produce butter of normal moisture, the rule of figuring the increase will compare favorably. This further emphasizes the importance of the Babcock test on the dairy farm, so they may know and not guess at results.

"CREAM TESTS WILL VARY."

When a dairyman begins testing his cream and finds a variation in the per cent. of butter fat, as he will, in different cans or different skimmings, he usually begins to wonder why there should be any difference.

The Department of Dairy Industry, Cornell University, Ithaca, N. Y., in April, 1915, issued a bulletin on this subject. It is entitled "Variations in tests for fat in cream and skimmed milk." We believe it is one of the best ever issued on this subject, and should be read by users of hand separators. In this bulletin they discussed the influence of temperature, of the milk, speed of the separator, the inflow and per cent. of fat in milk, etc. It appears that any one of these may be responsible for a considerable variation.

From the experiments conducted and the information given in this bulletin relative to temperature and speed, we have compiled the following tables. You will readily see that a variation up to 10 or 15% may be attributed to either speed or temperature. Please note that the same number of pounds of milk of the same percent of butter fat were separated in each case, and that the temperature only was varied. Therefore, the variation as shown can be attributed solely to temperature. The same is true of the table representing the speed of the separator. All other factors were controlled except the speed, therefore the variation in the test in this table can solely be attributed to the variation of the speed of the separator.

INFLUENCE OF TEMPERATURE ON THE PERCENT OF FAT IN CREAM.

Cornell University—Bulletin No. 360.

Lbs. of Milk Sept.	Percent of Fat	Temp. of Milk	Lbs. Skim Milk	Lbs. of Cream	% of Fat in Cream	% of fat diff.
83	4	90	72.	11.	30.	
83	4	80	74.25	8.75	36.5	6.5
83	4	75	75.5	7.5	44.	14.

If the milk is too cold when separated there is likely to be a greater loss of fat in the skimmed milk. Milk should be 90 degrees F. or above when separated.

THE INFLUENCE OF SPEED OF THE SEPARATOR ON THE PERCENT OF FAT IN CREAM MILK AND TEMPERATURE THE SAME IN EACH.

INDICATED SPEED—60 REV.

Milk Lbs.	Speed Sep.	Lbs. Cream	Cream Test	Lbs. Fat	Test Diff.
100	60	10.75	30.5	3.27	
100	54	14.	23.5	3.27	7%
100	50	15.5	21.	3.27	9.5%

"FEEDING VALUE OF SKIMMED MILK."

It would appear as though the average dairyman had lost sight of the value of skimmed milk or is pre-disposed to look upon it as being of the same value that it was some five or ten years ago.

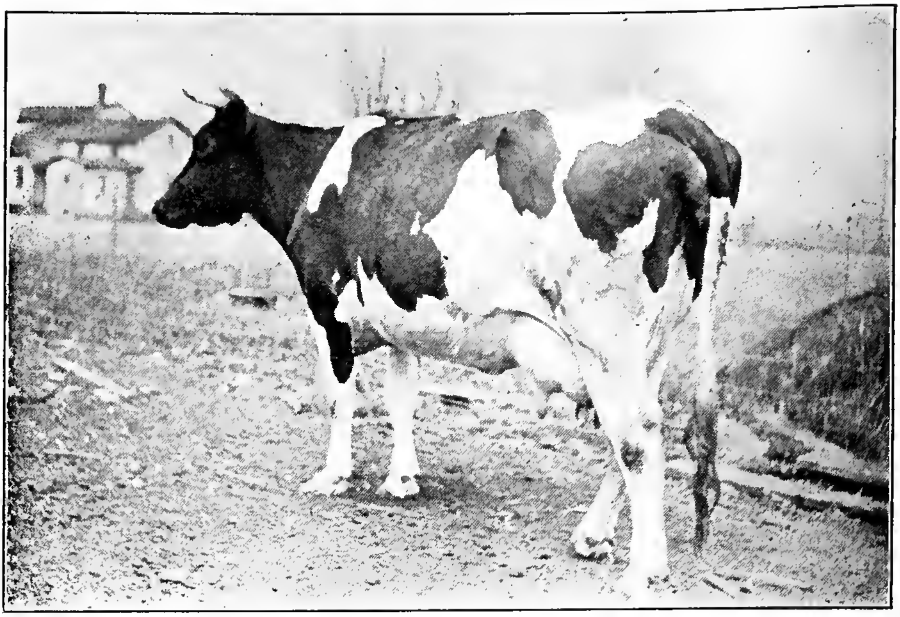
A number of tests have been made by Experiment Stations and dairy experts to arrive at a fair value to be placed upon it for feeding purposes. To do this intelligently skimmed milk has been compared with commercial feeds. At the time most of these tests were made, corn was selling at from 40 to 45 cents per bushel. It has since advanced until it has more than doubled in price. The feeding value of skimmed milk necessarily has increased in like proportion. From these experiments we learn that 100 pounds of skimmed milk fresh from the separator on the farm has 55% of the feeding value of the cost of one bushel of corn. Now, for example, if one bushel of corn costs 45c and 100 pounds of skimmed milk is worth 55% of this amount, we find that 100 pounds of skimmed milk would be worth 25c. Since, however, corn has more than doubled in value, the skimmed milk has increased in like proportion, therefore, must be considered to-day, compared with commercial feeds as being worth between 50 and 70 cents per hundred.

To reckon the value of skimmed milk from a purely commercial standpoint as above, does not do justice to its full value. It is peculiar in its nature, and being nature's food it produces results in the raising of young stock which cannot be obtained from any patent mill feed or substitute.

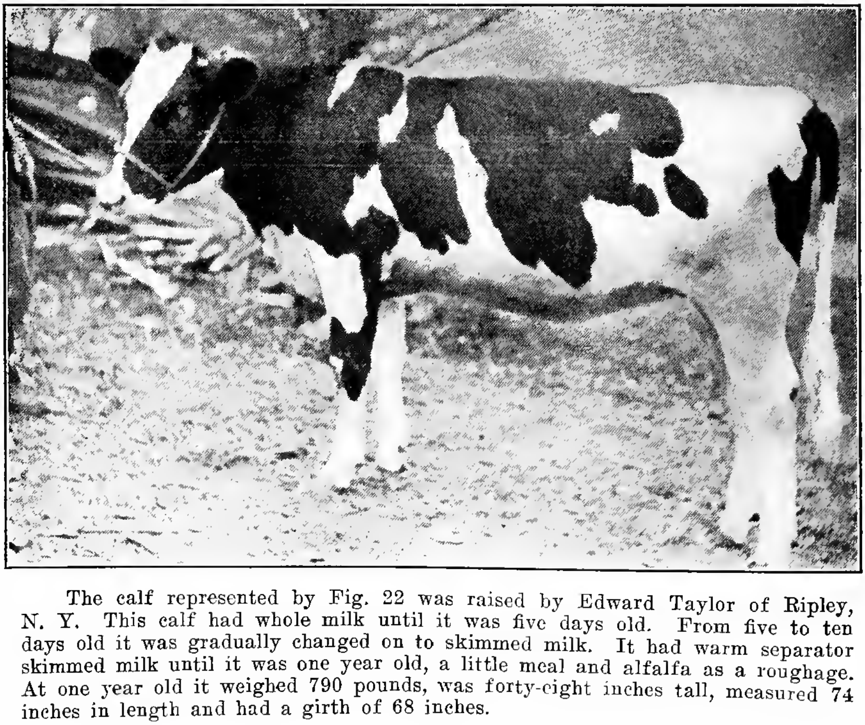
"MILK IS NATURE'S FOOD."

In the developing of young stock, milk is indispensable to their health, growth and proper development. The dairy cow is commonly looked upon as a dairy machine used to digest food and convert it into milk. Her ability to do this determines her value. If we violate a law of nature we must pay the penalty. Inasmuch as milk is nature's food, if we raise the calf on substitutes, it results in a poorly developed animal with digestive organs weakened and a reduced stamina. This lessens her efficiency or ability as a dairy machine, consequently her value, thus increasing the cost of operation making dairying less profitable. Intelligently viewing this subject from this standpoint the would-be prosperous dairyman cannot afford to dispense with his skimmed milk or trust to the animal raised on substitutes.

As a graphical illustration of the value of proper feeding, note Figs. 21 and 22 and the information given below them.

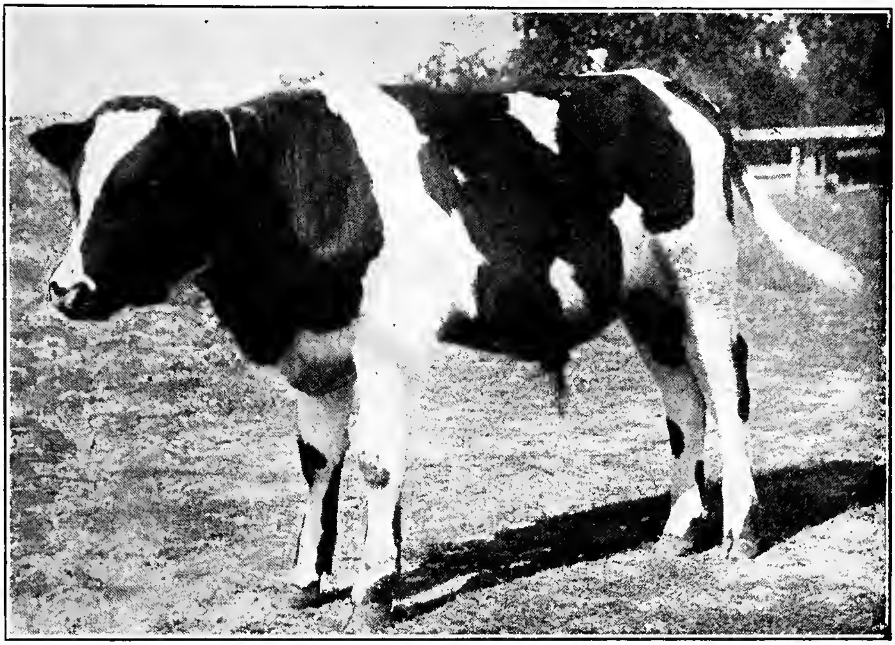


The cow represented by Fig. 21 is the mother of the calf represented by Fig. 22. The mother was raised on substitutes. Note her size and compare it with her calf of one year old.

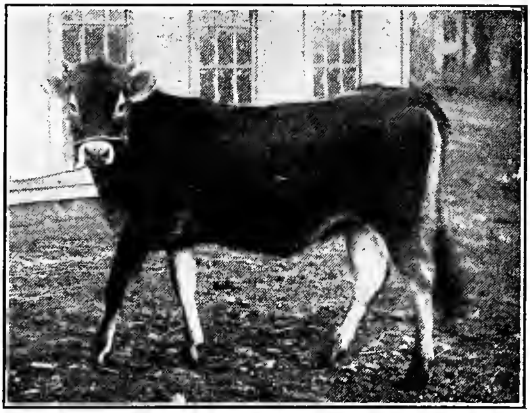


The calf represented by Fig. 22 was raised by Edward Taylor of Ripley, N. Y. This calf had whole milk until it was five days old. From five to ten days old it was gradually changed on to skimmed milk. It had warm separator skimmed milk until it was one year old, a little meal and alfalfa as a roughage. At one year old it weighed 790 pounds, was forty-eight inches tall, measured 74 inches in length and had a girth of 68 inches.

Also note cuts of others photographed by the writer, and the description of how they were raised, their age and weight. Surely these should be convincing evidence as to the feeding value of skimmed milk in the raising of calves.



The calf represented by Fig. 23 was raised on warm separator milk, had no whole milk after ten days old. It was photographed and weighed when six months old. It weighed 520 pounds. In addition to the warm separator milk which it got twice a day it had some meal, a mixture of middlings and oat chop, a little alfalfa hay as a roughage.



The calf represented by Fig. 24 was photographed when seven months old. It weighed 560 pounds and had no whole milk after it was ten days old. It got warm separator milk twice a day, a small quantity of meal, a mixture of middlings, oat chop and corn meal.

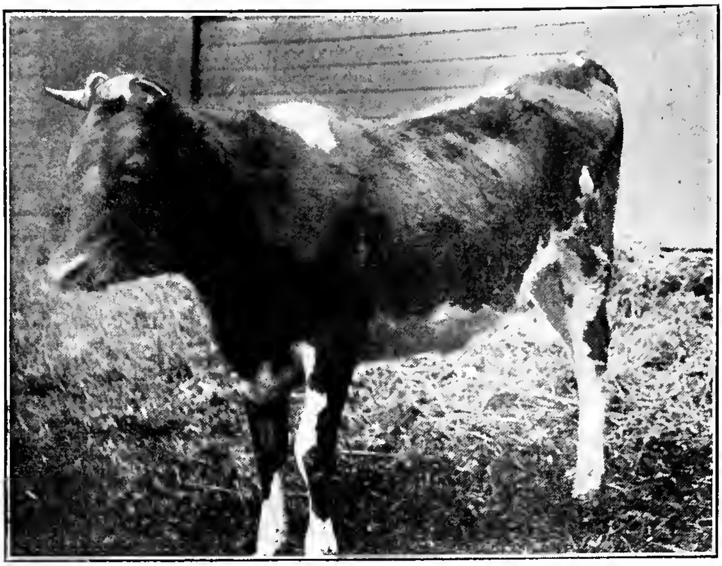


Fig. 25

The calf as represented by Fig. 25 was one year old when photographed. The weight was estimated at about 800 pounds. It had whole milk and warm separator milk twice a day until it was five or six months old, and warm separator milk from then until it was one year old, some meal and clover hay.

Surely these in themselves are sufficient evidence of the value of skimmed milk in the raising of stock. The old adage is true, "Breeding without Feeding availeth nothing." To violate a law of nature you must pay the penalty. Moral:—Raise your calves on warm separator milk if you wish to succeed as a dairy and stockman.

"THE RAISING OF CALVES ON SKIMMED MILK."

The term, "Raising of Calves" implies more than the mere feeding of the young animal, for it goes right back to the fundamental principles that have much to do with the health and vigor of the calf, and hence the future cow, as well as the training of same. If we were to assume the responsibility of raising the calf to get the best returns from our efforts, we should want to have full control of it from the time of its birth, for we are persuaded that many calves are so injured by thoughtless neglect when they are first born that it naturally effects their growth and development, consequently we should give more attention to the calf when it is first born than is generally given.

For example, the little calf is ushered into this world from an atmosphere of 102 F. and it may be that it finds itself in its new quarters with the temperature hovering around the freezing point, or below. Imagine, will you, the shock upon the system of this frail little critter. What will apply to the human being will as well apply to the animal. Imagine, will you, your condition were you to be treated likewise. Say for example that you were ushered out of a hot laundry with your clothes steaming and wet, and allowed to remain uncared for in an average cow barn for twelve to twenty hours with the temperature around the freezing point. What condition would you be in? Imagine now the condition of the calf if it has undergone this severe shock, and consequently, what we may expect in the way of health and growth.

We cannot, therefore, urge too strongly the care of the young animal. It should be as soon as born, rubbed dry with some gunny sack, or something of this nature, then blanketed and kept warm and comfortable during the first few days of its life until it becomes climatized. It may be allowed to remain with its mother for the first few days or taken away as soon as born. When it is taken from its mother this is where the danger begins, as the average feeder is inclined to feed too much, and at too long intervals. To produce the best growth it should receive not more than one quart of its mother's new milk at a feeding. It should be fed at least three times a day for the first few days. The sixth to eighth day we can begin substituting, remember, I said substituting skimmed milk for the whole milk. By no means increase the feed at this time; take away some of the whole milk and add that quantity in skimmed milk, doing this very gradually so as to completely change from the whole milk to the skimmed milk in from five to ten days. The calf will scarcely notice the difference, providing you do this intelligently, as no decided shock will be given its digestive organs.

However, at the time we begin to substitute the skimmed milk for the whole we should begin at once to replace the butter fat, by some cheaper form of carbonhydrates. This can best be done by using stock molasses in the ratio of about one tablespoonful to the gallon of milk. If too much of the molasses is added to the food it will likely purge the calf, but, there is little or no danger of the calf going off its feed. However, it is well to observe this, and be governed by the condition of the calf's bowels as to the amount of syrup to use. When it is about twelve to fourteen days old it will begin to nibble clover, or whatever nature of feed is accessible. At this time we can begin feeding a little meal. It should be fed dry by placing it in its bucket after it has drank its milk. It will interest itself in sucking the meal, and will extract a good deal of nutriment from it and will not annoy its stall mate. The meal can be increased just as the calf will digest it properly. Until the calf is three weeks old the meal ration should consist of linseed, oil meal, or cotton seed meal, and white shorts, equal parts. If this calf is going to be vealed a little ground corn can be added to its ration when it is about three weeks old, but on the other hand, if it is to be raised for a future animal it would be better to add ground oats to its ration rather than corn. The oats will not produce as much flesh, but it is one of the best bone-producing materials known to feeders, and this is exactly what we need in the young calf's food.

Care should be taken at all times to keep the calf in clean, dry surroundings, see that its bucket is kept clean, and also that it is never overfed. It has been conclusively proven that 90% of the cases we have of common scours can be assigned to uncleanliness and overfeeding.

"SKIMMED MILK VALUABLE AS AN EGG PRODUCER."

Each year the egg industry is becoming more important in the United States as a source of food and national wealth.

The egg production of the U. S. in the year 1899 amounted to
$144,240,541.00
in 1909, 306,688,960.00
or an increase in 1909 over 1899 of 112.6%. While we are unable to obtain the exact figures of the egg production for 1915, sufficient data is available to confirm the belief that the ratio of increase of 1909 has been surpassed. This marvelous increase in egg yield, in a large part must be assigned to the better feeding and management of the flock, as poultry increased only 48%, while the egg yield increased during the same period 112.6%. For more detailed statistics we refer you to the 13th census of the U. S., issued 1910.

The study within recent years made by our Experiment Stations as to the best feeds and management, and the information given out by them has done much toward this increased egg production. From the various experiments conducted, it has been proven conclusively that skimmed milk properly fed is the most valuable of all feeds for egg production known to poultry husbandry. Systematic tests made by the West Virginia Experiment Station prove, that skimmed milk is valuable for laying hens.

In some tests made by them, we find that 60 hens fed skimmed milk laid 862 eggs in 37 days, as compared with 632 laid by a like lot fed no milk. A large number of tests made by them give comparative results. Conductors of these experiments estimated that when eggs were selling at from 20c to 25c a dozen, that skimmed milk has a feeding value of from 75c to $1.00 per hundred. The value of skimmed milk will increase in proportion to the increase in the price of eggs. Therefore, if the eggs sell from 40 to 50 cents a dozen, or double the price mentioned, the value of the skimmed milk will be likewise doubled.

We also would refer you to some experiments conducted by Agricultural Station, Storrs, Conn., in which they say sour milk has an important stimulating effect on the growth and vitality of chicks, and for this reason alone is a most valuable food. They also state that the feeding of sour milk to chicks appears to be a good means of preventing or at least holding in check epidemic of bacillary white diarrhoea; hence whenever it is possible, sour milk may be an important agent in lessening the danger of a great loss from the disease. Sour milk should be fed early in life. Furthermore, it should be kept before the chicks constantly.

The question frequently asked by poultry men is "What shall I do to produce eggs in winter?" If the poultry men would be closer students of nature, it is believed that they would find a solution for the problem. The greatest egg yield is obtained in the early spring season. At this time of the year, plant and insect life is most vigorous, therefore the hens collect from nature's source a sufficient amount of animal and vegetable matter. Later in the season as the insect life disappears, the egg yield becomes less.

It is reasonable to believe, in fact it has been so proven, that if the hen is given comfortable quarters and the right feed, that she will lay as well in winter as in summer. To supply the insect life beef scraps and ground bones are frequently recommended. It is quite evident that the high feed value of skimmed milk is due to its nature. It is an animal product, and when fed to poultry takes the place of the insect life previously referred to. If the poultry be kept warm and are given sufficient water, and the proper feed, as well as green vegetables, or sprouted oats or wheat, they can be kept laying in winter as well as in summer. Now, if your skimmed milk is worth from one to two dollars per hundred for egg production, would it not be worth while for dairymen to consider seriously the selling of cream and retain the skimmed milk on their farm.

"THE MARKET VALUE OF EGGS."

Egg values in the commercial world is determined by their cleanliness, flavor size and color.

FIRST—CLEANLINESS: The cleanliness of eggs is very important. It is largely controlled by the cleanliness of the place where the hens are kept. If they have a clean run their feet will be clean, and hence the nest and eggs will generally be clean.

SECOND—FLAVOR: The flavor of an egg is above all important, and can be generally controlled by the farmer, and probably would be if the producers knew how. The shell of the egg and membranous is porous. This is evidenced by the fact that the chicken lives and breathes for some time before hatching, getting air through the shell. The white of the egg is an albuminous product. The yolk contains a high percentage of fat. Therefore, the egg will absorb odors nearly as readily as will milk or cream. The washing of the egg removes the natural seal, and leaves the egg more susceptible to flavors, or taint. On this account it is important that the eggs are kept clean and in clean surroundings, and not washed.

It has been conclusively proven by experiment that a germ free egg will keep good flavored for a long period under favorable temperature. This being true, it is important that the males of the flock are all removed as soon as the hatching season is over.

THIRD—SIZE: Small and immature birds are likely to produce small eggs. Chicks hatched from such eggs will be small and produce small eggs. Therefore, save your eggs for hatching from the largest and best matured hens.

FOURTH—COLOR: The strictly white egg is generally the best seller, especially if they are clean and have been kept clean without having been washed.

The producers of eggs generally do not comprehend the enormous loss sustained from dirty, tainted and rotten eggs. If the eggs were kept clean by keeping the surroundings and the nest clean, and the males removed from the flocks as above stated, the producers would receive a higher price, as the loss now caused by defective eggs if eliminated would raise the price.

For fuller information on this subject get bulletin 353 issued November, 1914, by the Department of Poultry Husbandry, Cornell University, Ithaca, N. Y.

"DO HOGS PAY?"

There seems to be a decided difference of opinion among farmers on this subject. It is not uncommon to find two men living close together with equal advantages as to markets, etc., one claiming that there is no money in producing pork, while the other is well satisfied with the profits from this branch of his farming.

These differences of opinion arouse the curiosity of the thinking observer. It has likewise stimulated many Experiment Stations to carefully study the subject.

The production of pork is a manufacturing business; that is, different eliments of feed are converted into another product from which a profit or loss results. When two men are engaged in the manufacture of a certain line of merchandise, and one fails while the other succeeds, it is very evident that both could succeed if the same efficiency or knowledge were applied to each business.

The hog is by nature a grazing animal, and should be pastured during the summer, and be furnished some succulent forage in winter. While he will make reasonable growth under confinement, the cost for the amount of gain produced is greatly increased, as compared when pastured.

"SKIMMED MILK AND FORAGE CROP CHEAPENS COST OF PRODUCTION."

The Missouri Experiment Station under an exhaustive experiment as given in bulletin 79, found that pasturing hogs on clover reduces the cost of production 75c per hundred, and when alfalfa was used the saving was about $1.00 per hundred. When skimmed milk was used the cheapest and most rapid gains were made.

Professor Henry of Wisconsin, in his book on Feeds and Feeding, page 572, gives the results of some very exhaustive investigations. In placing the money value on skimmed milk, he says 585 pounds of skimmed milk effect a saving of 179 pounds of corn meal. This makes three pounds of skimmed milk worth nearly as much as one pound of corn in producing pork. On the same page he says when corn meal is worth $30 per ton, and one pound of corn meal to 7 or 9 pounds of skimmed milk be fed, the milk is worth 27c per hundred, but when the meal is fed in proportion of one pound to three of skimmed milk, the skimmed milk is worth 46c per hundred.

It should be borne in mind that these experiments were in finishing the hog for market. The Canadian Experiment Station of Ottawa, Canada, made some very exhaustive experiments in connection with feeding skimmed milk. The data from these experiments would indicate that 1.83 pounds of skimmed milk were equivalent to one pound of corn. This emphasizes the great value of skimmed milk as a supplementary food, and to no other grain does this effect seem so marked as when used with corn. These two eminent authorities would seem to be almost conclusive as to the great value of skimmed milk when used with corn and properly prepared, as a pork producer.

The Ohio Experiment Station found that when corn was worth 56c per bushel, it costs $6.18 per hundred to produce pork, but when combined with skimmed milk, the ratio being one pound of corn meal to 2.77 pounds of skimmed milk, the cost was reduced from $6.18 per hundred to $4.11 per hundred. At the time these experiments were conducted, previously referred to, the average price of pork was $6.10 per hundred. The cost of corn and other feed have increased more than 100%, consequently skimmed milk value, if properly considered by the farmer has likewise increased.

Some farmers cannot grow alfalfa or clover for a pasturing crop. A good substitute for this will be found in sowing a mixture of peas, oats and rape, sown in the following proportion: one bushel Canadian peas, one bushel oats and six to ten pounds of dwarf rape, per acre. These should be sown quite early in the Spring. As soon as the peas and oats have reached a few inches in height, the hogs can be turned on. Better returns will be obtained if the hogs can be changed from one pasture to the other, thus giving the forage crop a chance to recuperate between times of pasturing. At the season of the year when the peas and oats begin to die out the dwarf rape will take its place. It will have established a good root, and will produce good forage crop for hogs until late in the Fall.

The hog should be fed a reasonable quantity of skimmed milk and should have an abundance of water. A very small amount of grain will be necessary when skimmed milk is fed in this way, and pork will be produced at a reasonable cost, leaving a good profit. The acre of ground thus pastured will be greatly increased in soil fertility, making it more valuable for crop production the following year. A good many farmers in New York State, are beginning to appreciate the advantage of growing hogs.

In New York State in 1910 there were only 666,199 hogs produced, while our neighbor state, Ohio, produced 3,105,627. Illinois with her high priced land, and not so conveniently situated for markets, produced 4,686,362. These are the figures taken from 1910 census of the United States and are believed to be correct.

We frequently hear some farmers say that farming and dairying does not pay. We usually find that in this case, the man is confining his energies to one industry, possibly the production of whole milk only. He does not even raise pork enough for his own use. In other words he is a consumer nor a producer. In selling whole milk he is selling a half manufactured article. He is losing the advantages that might be obtained from the by-products on the farm. Instead of buying his living he should produce it. In other words, it is not the amount of farming done, but the kind, that produces a good living and returns the profit.

"FERTILITY MEANS MONEY."

A great deal of commercial fertilizer is being bought in order to maintain soil fertility. If the proper method of farming was followed, this to a great extent might be eliminated. There are not many farmers, after selling their whole milk, stop to realize that their fertilizer bill has largely been caused by their method of disposing of their dairy product, and that the amount paid out for fertilizer should be charged back to the sale of milk, at the rate of at least 10 cents per hundred pounds of milk, in order to realize what they receive per hundred for it.

"Hoards Dairymen frequently calls the attention of the farmers to the great danger of soil depletion that comes if the whole milk is taken from the farm. Their issue of Nov. 15, 1912, says: "If the dairy farmers knew the facts as they really exist they would either feed the skimmed milk, or purchase the extra fertilizer, for if they do not, in a few years they greatly reduce the producing power of their land."

"For example, a cow giving 5000 pounds of milk, this sold from the farm represents twenty-nine pounds of nitrogen, 9½ pounds of phosphoric acid and 8½ pounds of potash removed. The market value of this is $5.50. Therefore the sale of milk from a herd of twenty cows would amount to a loss in fertility of $111.40 in one year. If the milk was separated, and the cream sold, testing 20%, he would lose 76c worth of soil fertility per cow. If sold in 40% cream he would lose 38c worth.

The cow, the swine and hen are the farmer's friends,
The calf, the pig and egg the dividends;
Therefore, the skimmed milk on the farm you must keep,
If not the soil it will deplete.

Cornell University Library
SF 253.F17

Simplified instructions on the Babcock t

3 1924 002 949 471

mann